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# New optical package and algorithms for accurate estimation and interactive recording of the cloud cover information over land and sea

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Cloud fraction is a critical parameter for the accurate estimation of short-wave and long-wave radiation - one of the most important surface fluxes over sea and land. Massive estimates of the total cloud cover as well as cloud amount for different layers of clouds are available from visual observations, satellite measurements and reanalyses. However, these data are subject of different uncertainties and need continuous validation against highly accurate in-situ measurements. Sky imaging with high resolution fish eye camera provides an excellent opportunity for collecting cloud cover data supplemented with additional characteristics hardly available from routine visual observations (e.g. structure of cloud cover under broken cloud conditions, parameters of distribution of cloud dimensions). We present operational automatic observational package which is based on fish eye camera taking sky images with high resolution (up to 1Hz) in time and a spatial resolution of 968x648px. This spatial resolution has been justified as an optimal by several sensitivity experiments. For the use of the package at research vessel when the horizontal positioning becomes critical, a special extension of the hardware and software to the package has been developed. These modules provide the explicit detection of the optimal moment for shooting. For the post processing of sky images we developed a software realizing the algorithm of the filtering of sunburn effect in case of small and moderate could cover and broken cloud conditions. The same algorithm accurately quantifies the cloud fraction by analyzing color mixture for each point and introducing the so-called "grayness rate index" for every pixel. The accuracy of the algorithm has been tested using the data collected during several campaigns in 2005-2011 in the North Atlantic Ocean. The collection of images included more than 3000 images for different cloud conditions supplied with observations of standard parameters. The system is fully autonomous and has a block for digital data collection at the hard disk. The system has been tested for a wide range of open ocean cloud conditions and we will demonstrate some pilot results of data processing and physical interpretation of fractional cloud cover estimation.